

REMARKS

Claims 1-8, 16-28, and 37 are pending. Claim 1, 16, 22, and 37 are in independent form.

In the action mailed May 16, 2007, claims 1-3, 6, 16, and 37 were rejected under the judicially-created doctrine of obviousness-type double patenting over claims 1-3, 6, 16, and 37 in U.S. Patent Application Serial No. 10/681,030. As shown above, claims 1-3, 6, 16, and 37 have been amended. Applicant respectfully requests that the double patenting rejection be reconsidered in light thereof.

CLAIM 1

Claim 1 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,517,280 to Okamoto et al. (hereinafter "Okamoto").

As amended, claim 1 relates to a method that includes patterning a substrate with a substantially arbitrary arrangement of features. The patterning includes patterning an array of repeating lines and spaces between the lines in a first photoresist layer and introducing irregularity into an area of the substrate covered by the array of repeating lines and spaces. The irregularity is introduced by forming an arbitrary figure in a second photoresist layer above the array.

The arbitrary figure comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions.

The rejection of former claim 1 is based on the contention that the gratings produced by Okamoto in his substrates are "substantially arbitrary arrangement[s] of features" with which a substrate is patterned.

Applicant disagrees. Nevertheless, to advance prosecution, claim 1 has been amended to recite that irregularity is introduced by forming, in a photoresist above an array, an arbitrary figure that comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces of the array at different longitudinal positions. An example of such a figure and its features are shown, e.g., in FIG. 7.

Thus, not only are the gratings formed in Okamoto's substrates not "substantially arbitrary arrangement of features," Okamoto's window B does not include the recited figure and its features. In this regard, Okamoto is concerned with making diffraction gratings of a specific size at a specific location on a substrate. *See, e.g., Okamoto*, col. 1, line 6-8; col. 2, line 31-34.

In order to form such diffraction gratings, Okamoto describes that a single window A can be formed in a photoresist layer above the portion of a substrate where a diffraction grating pattern is desired. *See, e.g., id., col. 2, line 36-40; col. 4, line 25-33.* The photoresist with window A can be developed, and etching can proceed in the portion of the substrate exposed by window A. *See, e.g., id., col. 4, line 42-49.* The substrate in other areas (i.e., areas not exposed by window A) remains intact. *Id., col. 4, line 51-53.* After stripping, a single diffraction grating is left behind in the desired location. *Id., col. 4, line 54-56.*

As a threshold matter, the gratings formed on Okamoto's substrates are not a substantially arbitrary arrangement of features. For a grating to function, it must possess a sufficiently periodic arrangement of features that is not arbitrary.

Moreover, Okamoto's window A does not include noncontiguous first and second features that each bridge one or more of the repeating lines and spaces of the array at different longitudinal positions. In this regard, Okamoto's window A is a single window.

Accordingly, claim 1 is not anticipated by Okamoto.
Applicant respectfully requests that the rejections of claim 1 and the claims dependent therefrom be withdrawn.

Former claim 1 was also rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,337,175 to Yamaguchi (hereinafter "Yamaguchi").

The rejection of former claim 1 was based on the contention that Yamaguchi's double exposure and development of a single resist layer involved forming an arbitrary figure in a photoresist above the array.

Applicant respectfully disagrees. Nevertheless, claim 1 has been amended to recite that an array of repeating lines and spaces is patterned in a first photoresist layer and that an arbitrary figure is formed in a second photoresist layer above the array.

Since Yamaguchi describes that a single resist layer and an acid-generating resin are used, claim 1 is not anticipated by Yamaguchi. Applicant respectfully requests that the rejections of claim 1 and the claims dependent therefrom be withdrawn.

CLAIM 16

Claim 16 was rejected under 35 U.S.C. § 102(b) as anticipated by Okamoto.

Claim 16 relates to a method that includes interfering electromagnetic radiation to illuminate a substrate with an interference pattern, and introducing irregularity into an area on the substrate covered by repeating lines and spaces to impart an arbitrary feature arrangement to the substrate. Introducing irregularity includes forming an arbitrary figure in a second photoresist layer above a portion of the repeating lines and spaces. The arbitrary figure includes a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions. The interference pattern imparts a first photoresist layer on the substrate with repeating lines and spaces.

The rejection of former claim 16 is based on the contention that the gratings produced by Okamoto in his substrates are "an arbitrary feature arrangement" that is imparted to a substrate.

Applicant disagrees. Nevertheless, to advance prosecution, claim 16 has been amended to recite that irregularity is introduced by forming, in a second photoresist above a portion of the repeating lines and spaces, an arbitrary figure that comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating

lines and spaces of the array at different longitudinal positions.

Thus, not only are the gratings formed in Okamoto's substrates not "an arbitrary feature arrangement," Okamoto's window B does not include the recited figure and its features.

Accordingly, claim 16 is not anticipated by Okamoto. Applicant respectfully requests that the rejections of claim 16 and the claims dependent therefrom be withdrawn.

CLAIM 22

Claim 22 was rejected under 35 U.S.C. § 103(a) as obvious over Okamoto and European Patent Application EP 0915384 to Sugita et al. (hereinafter "Sugita").

As amended, claim 22 relates to a method that includes patterning a first layer on substrate using a first lithographic technique, printing, in a photoresist layer using a second lithographic technique providing a second pitch, a first feature to bridge a first collection of one or more of the repeating lines and spaces at a first longitudinal position, a second feature to bridge a second collection of one or more of the repeating lines and spaces at a second longitudinal position, and a third feature to bridge a third collection of one or more of the repeating lines and spaces at a third longitudinal position, and etching the substrate to transfer, to the

substrate, a superposition of the lines and spaces with the first feature, the second feature, and the third feature. The patterning provides lines and spaces in the first layer with a first pitch yielding a first k_1 factor smaller than or equal to 0.5. The first feature, the second feature, and the third feature are noncontiguous. The second pitch is two or more times larger than the first pitch. The continuity of at least the first collection, the second collection, and the third collection is broken in the transferred superposition.

The rejection of former claim 22 was based on the contention that it would have been obvious for one of ordinary skill to have combined Okamoto and Sugita to have arrived at the claimed subject matter.

Applicant respectfully disagrees. Nevertheless, to advance prosecution, claim 22 has been amended to recite that a first, a second, and a third noncontiguous feature are printed to bridge collections of one or more of the repeating lines and spaces at different longitudinal positions.

Okamoto's window B does not include the recited features. Indeed, Okamoto's window B is understood to be a window so that Okamoto can form a diffraction grating at a desired location on a substrate.

Sugita does nothing to remedy these deficiencies in Okamoto. In this regard, Sugita describes a system that uses "multiplex exposure amounts" to produce a pattern. *See, e.g., Sugita*, para. [0106]. According to Canon, multiplex exposure amounts are achieved when three or more exposure levels (including zero level exposures) are used in a single layer of photoresist. This contrasts with the two exposure levels of a binary exposure levels system. *Id.*, para. [0032]. FIGS. 8A, 8B, 9A, 9B of Sugita illustrate Sugita's use of multiple exposure levels. In particular, the exposure levels denoted "0" and "1" are below the threshold exposure level " E_{th} " whereas the exposure levels denoted "2" and "3" are above the threshold exposure level " E_{th} ." Sugita thus relies upon the accumulation of successive dosages in a single layer of photoresist to define regions that are above the threshold exposure level " E_{th} ."

Applicant respectfully submits that such an accumulation of different dosage levels in a single layer of photoresist would not lead one of ordinary skill to modify Okamoto's window B to include the recited figure and its features.

Accordingly, claim 22 is not obvious over Okamoto and Sugita. Applicant respectfully requests that the rejections of claim 22 and the claims dependent therefrom be withdrawn.

CLAIM 37

Claim 37 was rejected under 35 U.S.C. § 103(a) as obvious over Okamoto and Sugita.

As amended, claim 37 relates to a method that includes patterning a first layer of photoresist on a substrate using interference lithography to provide a collection of periodic lines and spaces having a first pitch, patterning a second layer of photoresist using a second lithographic technique to provide an arbitrary feature with a second pitch, and etching the substrate to transfer a superposition of the lines and spaces provided by patterning the first layer and the arbitrary feature provided by patterning the second layer to the substrate. The second pitch is two or more times larger than the first pitch. The arbitrary figure comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions. The continuity of at least one of the lines and spaces is broken at the different longitudinal positions in the transferred superposition.

The rejection of former claim 37 was based on the contention that it would have been obvious for one of ordinary skill to have combined Okamoto and Sugita to have arrived at the claimed subject matter.

Applicant respectfully disagrees. Nevertheless, to advance prosecution, claim 37 has been amended to recite that an arbitrary figure that comprises a first feature and a second feature that are noncontiguous and that each bridge one or more of the repeating lines and spaces at different longitudinal positions is provide by patterning a second layer of photoresist.

Okamoto's window B is not an arbitrary figure, nor does it include the recited features. Indeed, Okamoto's window B is understood to be a window so that Okamoto can form a diffraction grating at a desired location on a substrate.

Sugita does nothing to remedy these deficiencies in Okamoto. In this regard, as discussed above, Sugita relies upon the accumulation of successive dosages in a single layer of photoresist to define regions that are above a threshold exposure level. Such an accumulation of different dosage levels in a single layer of photoresist would not lead one of ordinary skill to modify Okamoto's window B to include the recited arbitrary figure and its features.

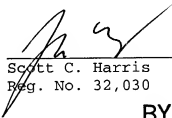
Accordingly, claim 37 is not obvious over Okamoto and Sugita. Applicant respectfully requests that the rejections of claim 37 and the claims dependent therefrom be withdrawn.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicant asks that all claims be allowed. No fees are believed due at this time. Please apply any charges or credits, to Depcsit Account No. 06-1050.

Respectfully submitted,

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